Claims

1. An ejector-type refrigerant cycle device, comprising:

a compressor (12) that sucks and compresses refrigerant;

a radiator (13) that radiates heat from the high-pressure refrigerant discharged from the compressor (12);

an ejector (14) having a nozzle portion (14a) that depressurizes and expands refrigerant on a downstream side of the radiator (13), and a refrigerant suction port (14c) through which refrigerant is sucked by the flow of refrigerant jetted at high speed from the nozzle portion (14a);

a first evaporator (15) having a refrigerant outflow side connected to a suction side of the compressor (12);

a first branch passage (17) that branches a flow of refrigerant upstream of the ejector (14) and guides the branched flow of refrigerant to the refrigerant suction port (14c);

a first throttling means (18) that is disposed in the first branch passage (17) and depressurizes and expands refrigerant; and

a second evaporator (19) that is disposed in the first branch passage (17) downstream of the first throttling means (18), the refrigerant cycle device being characterized in that:

a refrigerant evaporating pressure of the second evaporator (19) is lower than a refrigerant evaporating pressure of the first evaporator (15); and

the first throttling means (18) is provided with a fully opening function, and fully opens the first branch passage (17) when the second evaporator (19) is defrosted.

2. An ejector-type refrigerant cycle device, comprising:

a compressor (12) that sucks and compresses refrigerant;

a radiator (13) that radiates heat from high-pressure refrigerant discharged from the compressor (12);

an ejector (14) having a nozzle portion (14a) that depressurizes and expands refrigerant on a downstream side of the radiator (13), and a refrigerant suction port (14c) through which refrigerant is sucked by the flow of refrigerant jetted at high speed from the nozzle portion (14a);

a first evaporator (15) having a refrigerant outflow side connected to a suction side of the compressor (12);

a first branch passage (17) that branches a flow of refrigerant upstream of the ejector (14) and guides the branched flow of refrigerant to the refrigerant suction port (14c);

a first throttling means (180) that is disposed in the first branch passage (17) and depressurizes and expands refrigerant;

a second evaporator (19) that is disposed in the first branch passage (17) downstream of the first throttling means (180);

a bypass passage (23) that guides the high-pressure refrigerant discharged from the compressor (12) directly into the second evaporator (19); and

a shut mechanism (24) that is provided in the bypass passage (23), the refrigerant cycle device being characterized in that:

a refrigerant evaporating pressure of the second evaporator (19) is lower than a refrigerant evaporating pressure of the first evaporator (15), and

the shut mechanism (24) is constructed to be normally closed, and to open the bypass passage (23) when the second evaporator (19) is

defrosted.

3. An ejector-type refrigerant cycle device, comprising:

a compressor (12) that sucks and compresses refrigerant;

a radiator (13) that radiates heat from the high-pressure refrigerant discharged from the compressor (12);

an ejector (14) having a nozzle portion (14a) that depressurizes and expands refrigerant on the downstream side of the radiator (13) and a refrigerant suction port (14c) through which refrigerant is sucked by the flow of refrigerant jetted at high speed from the nozzle portion (14a);

a first evaporator (15) having a refrigerant outflow side connected to a suction side of the compressor (12);

a first branch passage (17) that branches a flow of refrigerant upstream of the ejector (14) and guides the branched flow of refrigerant to the refrigerant suction port (14c);

a first throttling means (180) that is disposed in the first branch passage (17) and depressurizes and expands refrigerant;

a second evaporator (19) that is disposed in the first branch passage (17) downstream of the first throttling means (180);

a bypass passage (33) that bypasses the first throttling means (180); and

a shut mechanism (34) that is provided in the bypass passage (33), the refrigerant cycle device being characterized in that:

a refrigerant evaporating pressure of the second evaporator (19) is lower than a refrigerant evaporating pressure of the first evaporator (15); and

the shut mechanism (34) is constructed to be normally closed, and

to open the bypass passage (33) when the second evaporator (19) is defrosted.

4. The ejector-type refrigerant cycle device according to Claim 1, further comprising:

a third evaporator (27) that evaporates refrigerant to have a cooling capability in a temperature zone that is the same as that of the first evaporator (15).

5. The ejector-type refrigerant cycle device according to Claim 4, further comprising:

a second branch passage (25) that branches the flow of refrigerant at a portion of the first branch passage (17) positioned upstream of the first throttling means (18, 180) and joins the branched flow of refrigerant to the flow of refrigerant between the refrigerant outflow side of the first evaporator (15) and the suction side of the compressor (12); and

a second throttling means (26) that is disposed in the second branch passage (25) and depressurizes and expands refrigerant, the refrigerant cycle device being characterized in that:

the third evaporator (27) is disposed in the second branch passage (25) downstream of the second throttling means (26).

6. The ejector-type refrigerant cycle device according to any of Claims 1 to 5, characterized in that:

the first evaporator (15) is connected to a refrigerant outflow side of the ejector (14).

7. The ejector-type refrigerant cycle device according to any of Claims 1 to 5, characterized in that:

a third throttling means (30) is provided between a refrigerant outflow side of the radiator (13) and a refrigerant inflow side of the first evaporator (15), and the ejector (14) is provided in parallel with the third throttling means (30).

8. The ejector-type refrigerant cycle device according to any of Claims 1 to 5, further comprising:

a shut mechanism (31) that shuts a passage area located upstream of the ejector (14) when the second evaporator (19) is defrosted.

9. The ejector-type refrigerant cycle device according to Claim 2, further comprising:

a shut mechanism (32) that shuts a passage area located upstream of the radiator (13) when the second evaporator (19) is defrosted.

10. An ejector-type refrigerant cycle device comprising:

a compressor (12) that sucks and compresses refrigerant;

a radiator (13) that radiates heat from a high-pressure refrigerant discharged from the compressor (12);

an ejector (14) having a nozzle portion (14a) that depressurizes and expands refrigerant on a downstream side of the radiator (13), and a refrigerant suction port (14c) through which refrigerant is sucked by the flow of refrigerant jetted at high speed from the nozzle portion (14a);

a first evaporator (15) that evaporates the refrigerant flowing out of the ejector (14);

a vapor-liquid separator (35) that separates the refrigerant flowing out of the first evaporator (15) into vapor and liquid, and stores liquid phase refrigerant and lets vapor phase refrigerant out to a suction side of the compressor (12);

a branch passage (36) that connects a liquid phase refrigerant outlet of the vapor-liquid separator (35) to the refrigerant suction port (14c);

a throttling means (180) that is disposed in the branch passage (36), and depressurizes and expands the liquid phase refrigerant flowing out of the vapor-liquid separator (35);

a second evaporator (19) that is disposed in the branch passage (36) downstream of the throttling means (180);

a bypass passage (23) that guides the high-pressure refrigerant discharged from the compressor (12) directly into the second evaporator (19); and

a shut mechanism (24) that is provided in the bypass passage (23), the refrigerant cycle device being characterized in that:

a refrigerant evaporating pressure of the second evaporator (19) is lower than a refrigerant evaporating pressure of the first evaporator (15), and

the shut mechanism (24) is constructed to be normally closed, and to open the bypass passage (23) when the second evaporator (19) is defrosted.

11. An ejector-type refrigerant cycle device comprising:

a compressor (12) that sucks and compresses refrigerant;

a radiator (13) that radiates heat from high-pressure refrigerant discharged from the compressor (12);

an ejector (14) having a nozzle portion (14a) that depressurizes and expands refrigerant on a downstream side of the radiator (13), and a refrigerant suction port (14c) through which refrigerant is sucked by the flow of refrigerant jetted at high speed from the nozzle portion (14a);

a first evaporator (15) having a refrigerant outflow side connected to a suction side of the compressor (12);

a second evaporator (19) having a refrigerant outflow side connected to the refrigerant suction port (14c);

a first throttling mechanism (38) that is disposed on a refrigerant outflow side of the first evaporator (15);

a second throttling mechanism (18) that is provided on a refrigerant inflow side of the second evaporator (19); and

a controlling means (21) that controls an opening of the first throttling mechanism (38) and an opening of the second throttling mechanism (18), and switches an operation mode between a normal operation mode in which low-pressure refrigerant is evaporated at the first evaporator (15) and the second evaporator (19) and a defrosting operation mode in which high-pressure, high-temperature refrigerant on a discharge side of the compressor (12) is introduced into both the second evaporator (19) and the first evaporator (15) to defrost both the evaporators (15, 19).

12. The ejector-type refrigerant cycle device according to Claim 11, characterized in that:

in the defrosting operation mode, the first throttling mechanism (38) is brought into a state of a predetermined throttle opening and the second throttling mechanism (18) is brought into a fully open state.

13. An ejector-type refrigerant cycle device comprising:

a compressor (12) that sucks and compresses refrigerant;

a radiator (13) that radiates heat from the high-pressure refrigerant discharged from the compressor (12);

an ejector (14) having a nozzle portion (14a) that depressurizes and expands refrigerant on a downstream side of the radiator (13), and a refrigerant suction port (14c) through which refrigerant is sucked by the flow of refrigerant jetted at high speed from the nozzle portion (14a);

a first evaporator (15) having a refrigerant outflow side connected to the suction side of the compressor (12);

a second evaporator (19) having a refrigerant outflow side connected to the refrigerant suction port (14c);

a first throttling mechanism (18) that is provided on a refrigerant inflow side of the second evaporator (19);

a second throttling mechanism (39) that is provided on a refrigerant outflow side of the second evaporator (19); and

a controlling means (21) that controls an opening of the first throttling mechanism (18) and an opening of the second throttling mechanism (39), and switches an operation mode between a normal operation mode in which low-pressure refrigerant is evaporated at the first evaporator (15) and the second evaporator (19) and a defrosting and cooling operation mode in which the second evaporator (19) is defrosted and at the same time the first evaporator (15) has a cooling capability, the refrigerant cycle device being characterized in that:

in the defrosting and cooling operation mode, high-pressure, high-temperature refrigerant on a discharge side of the compressor (12) is introduced into the second evaporator (19) to defrost the second evaporator

(19), and further high-pressure refrigerant that passed through the second evaporator (19) is depressurized by the second throttling mechanism (39) and low-pressure refrigerant depressurized is introduced into the first evaporator (15) to cause the first evaporator (15) to carry out a cooling function.

14. The ejector-type refrigerant cycle device according to Claim 13, characterized in that:

in the defrosting and cooling operation mode, the first throttling mechanism (18) is brought into a fully open state and the second throttling mechanism (39) is brought into a state of a predetermined throttle opening.

15. An ejector-type refrigerant cycle device comprising:

a compressor (12) that sucks and compresses refrigerant;

a radiator (13) the radiates heat from high-pressure refrigerant discharged from the compressor (12);

an ejector (14) having a nozzle portion (14a) that depressurizes and expands refrigerant on a downstream side of the radiator (13) and a refrigerant suction port (14c) through which refrigerant is sucked by the flow of refrigerant jetted at high speed from the nozzle portion (14a);

a first evaporator (15) having a refrigerant outflow side connected to the suction side of the compressor (12);

a second evaporator (19) having a refrigerant outflow side connected to the refrigerant suction port (14c);

a throttling mechanism (181) that is provided on a refrigerant inflow side of the second evaporator (19); and

a controlling means (21) that switches an operation mode between a

normal operation mode in which a state in which heat is radiated from refrigerant in the radiator (13) is set and low-pressure refrigerant is evaporated in the first evaporator (15) and the second evaporator (19), and a defrosting operation mode in which a state in which heat is not radiated from refrigerant at the radiator (13) is set and both the first evaporator (15) and the second evaporator (19) are defrosted, the refrigerant cycle device being characterized in that:

in the defrosting operation mode, refrigerant on a discharge side of the compressor (12) is let to flow into the throttling mechanism (181) in a high-pressure, high-temperature state and depressurized, and a low-pressure, high-temperature vapor phase refrigerant that passed through the throttling mechanism (181) is guided into both the first evaporator (15) and the second evaporator (19).

16. The ejector-type refrigerant cycle device according to Claim 15, characterized in that:

an opening of the throttling mechanism (181) is made larger in the defrosting operation mode than in the normal operation mode.

17. The ejector-type refrigerant cycle device according to any one of Claims 11, 12, 15, and 16, characterized in that:

an air blowing means (13a) is provided to blow cooling air to the radiator (13), wherein

in the defrosting operation mode, the air blowing means (13a) is brought into a stopped state.

18. The ejector-type refrigerant cycle device according to Claim 15

or 16, further comprising:

a radiator bypass passage (40) that bypasses a refrigerant passage of the radiator (13); and

a bypassing shut mechanism (41) that is provided in the radiator bypass passage (40), the refrigerant cycle device being characterized in that:

in the defrosting operation mode, the bypassing shut mechanism (41) is brought into an open state, and high-pressure, high-temperature refrigerant on a discharge side of the compressor (12) is introduced into the throttling mechanism (181) through the radiator bypass passage (40).

19. The ejector-type refrigerant cycle device according to Claim 18, characterized in that:

a radiator shut mechanism (42) is provided at the refrigerant outlet portion of the radiator (13) in parallel with the bypassing shut mechanism (41), and an air blowing means (13a) is provided to blow cooling air to the radiator (13), and

in the defrosting operation mode, the bypassing shut mechanism (41) is brought into an open state and the radiator shut mechanism (42) is brought into a closed state, and the air blowing means (13a) is brought into an operating state.

20. The ejector-type refrigerant cycle device according to any of Claims 11, 12, 15, and 16, characterized in that:

an ejector shut mechanism (31) is provided in a passage located upstream of the ejector (14); and

in the defrosting operation mode and in the defrosting and cooling

operation mode, the passage located upstream of the ejector (14) is brought into a closed state by the ejector shut mechanism (31).

21. The ejector-type refrigerant cycle device according to any of Claims 1 to 3, 10 to 12, 15, and 16, characterized in that:

a vapor-liquid separator (35) is provided on a refrigerant outflow side of the first evaporator (15); and

the vapor-liquid separator (35) separates refrigerant into vapor and liquid, and stores liquid phase refrigerant and lets vapor phase refrigerant out to a refrigerant suction side of the compressor (12).